OAK MORTALITY SURVEY

at

EARLE NAVAL WEAPONS STATION

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ABSTRACT

Gypsy moth populations caused widespread defoliation at Earle Naval Weapons Station in 2006, 2007 and 2008. A 5896 acre gypsy moth suppression project was implemented in 2009 to prevent continued defoliation. Although defoliation was not detected at Earle Naval Weapons Station in 2009, significant tree mortality was detected. Most of the mortality was located in or near areas where gypsy moth defoliation was detected from 2006-2008.

This mortality will be identified and quantified in the report, possible consequences of the mortality will be discussed along with recommendations to prevent future mortality.

INTRODUCTION

Earle Naval Weapons Station (Earle NWS) is located in Monmouth County, New Jersey, approximately 5 miles east of Freehold, New Jersey (Figure 1). This 11,851 acre Department of Defense facility is dissected from north to south by NJ SR 34 and is bordered to the south by NJ SR 33. In addition to the forested areas, Earle NWS is comprised by several small streams, ponds and wet areas, administrative buildings, testing facilities, housing/residential areas, recreational areas, extensive weapons storage areas along with a network of roads and railroad tracks. The terrain is fairly flat with elevation ranging from approximately 60 to 307 feet above sea level.

Most of the forested areas have sandy soils that are well drained. Species of oaks dominate the overstory in these areas with blueberry dominating the understory.

METHODS

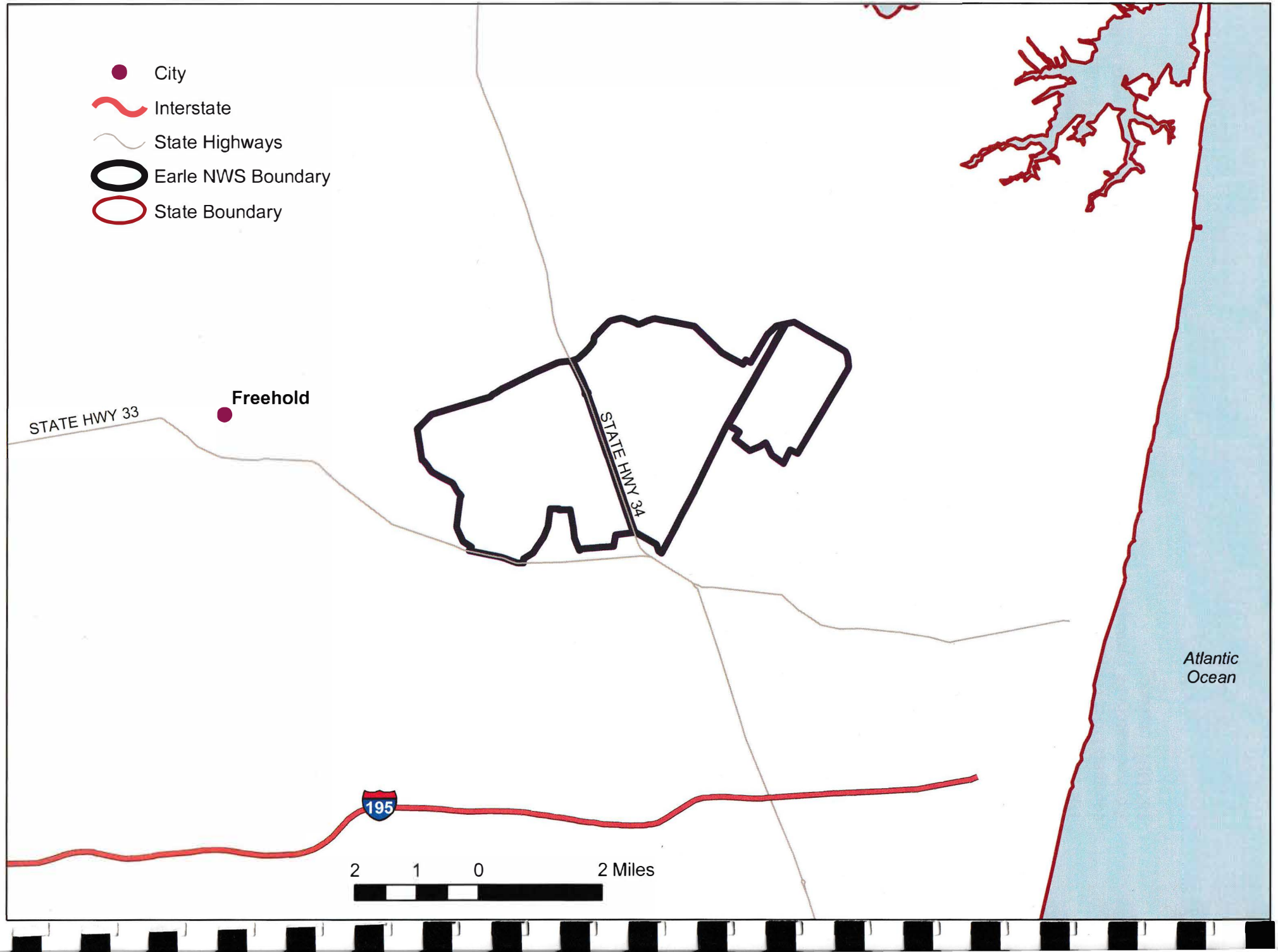
Mortality areas were delineated on a 1-26,000 scale aerial photograph during an aerial survey of Earle NWS conducted on June 17, 2009. A high-wing airplane was used for the aerial survey and was flown at an altitude of approximately 1000 feet above ground level and at an airspeed of 140 mph.

The boundaries of the mortality areas were then fine tuned during the ground survey conducted on July 29, 2009. Several smaller mortality areas (less than an acre in size) that were missed during the aerial survey were also delineated during the ground survey.

During the ground survey, 10 basal area factor (BAF) prism plots were randomly established in the delineated mortality areas. At each of the 25 prism plots, species, diameter breast height (DBH), crown class and crown condition were recorded for "in" trees. Sawtimber and or cordwood volumes were also estimated for all "in" trees. General observations were also made at each plot regarding the understory and regeneration.

Two inch DBH classes were used. Trees with a DBH from 1"- 2.9" were placed in the 2" class, trees with a DBH from 3.0"-4.9" were placed in the 4" class, etc.

Figure 1.- General location map of Earle Naval Weapons Station.



The crown class of each "in" tree was then placed into one of the four crown class classes based on crown location in the canopy.

> Dominant or crown class 1 – crown of tree extends above most of the other canopy and receives sun light from above and partly from the sides
> Codominant or crown class 2 – crown of tree forms general level of canopy and receives sun light primarily from above and moderate amounts from the sides
> Intermediate or crown class 3 – tree is shorter than a dominant or codominant tree, crown may extend into the canopy but receives only partial sun light from above and very little from the sides
> Suppressed or crown class 4 – crown is located beneath the general canopy and receives no direct sun light from above or from the sides.

The crown condition of each "in" tree was then placed into one of the five crown condition classes based on branch dieback.

> crown condition 1 = ≥ 5% branch dieback (insignificant dieback)
> crown condition 2 = 6-25% branch dieback (light dieback)
> crown condition 3 = 26-50% branch dieback (moderate dieback)
> crown condition 4 = 51-75% branch dieback (heavy dieback)
> crown condition 5 = 76-99% branch dieback (severe dieback)
> crown condition 6 = 100% branch dieback (dead)

The number of sawtimber quality 8 foot logs to an 8 inch diameter top were recorded for all "in" trees 12″ DBH or greater and was used in calculating board feet volume. The number of 8 foot logs to a 4" top that were not of sawtimber quality were recorded for all "in" trees and was used in determining cordwood volume. The sawtimber and cordwood volumes were then calculated on a per acre basis.

RESULTS

A total of 168 mortality areas, encompassing 602 acres, were delineated and ranged from .24 to 68 acres in size (Figure 2). There were 107 delineated mortality areas less than one acre and five mortality areas over twenty five acres.

A total of 268 trees were tallied during the ground survey. Oak species accounted for 243 or 91% of the trees while non-oak species accounted for only 25 or 9% of the trees. Chestnut oak (*Quercus prinus*) was the most common tree in the mortality areas followed by white oak (*Quercus alba),* red oak (*Quercus rubra*), black oak (*Quercus velutina*) and scarlet oak (*Quercus coccinea*). Other species found in very limited amounts included pitch pine (*Pinus rigida*), sassafras, (*sassafras albidum*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*) and sweetgum (*Liquidambar styraciflua*).

The DBH of the tallied trees ranged from 2″-26″ and averaged approximately 11.2 inches. The most common DBH class was the 10″ class and it accounted for approximately 23 percent of all the trees. Approximately 55 percent of the trees were in the 8″-12″ DBH classes while 88 percent were in the 6″-16″ DBH classes.

ugh aerial and ground surveys conducted at Earle Naval Weapons Station on June 17 and July 29, 2009.

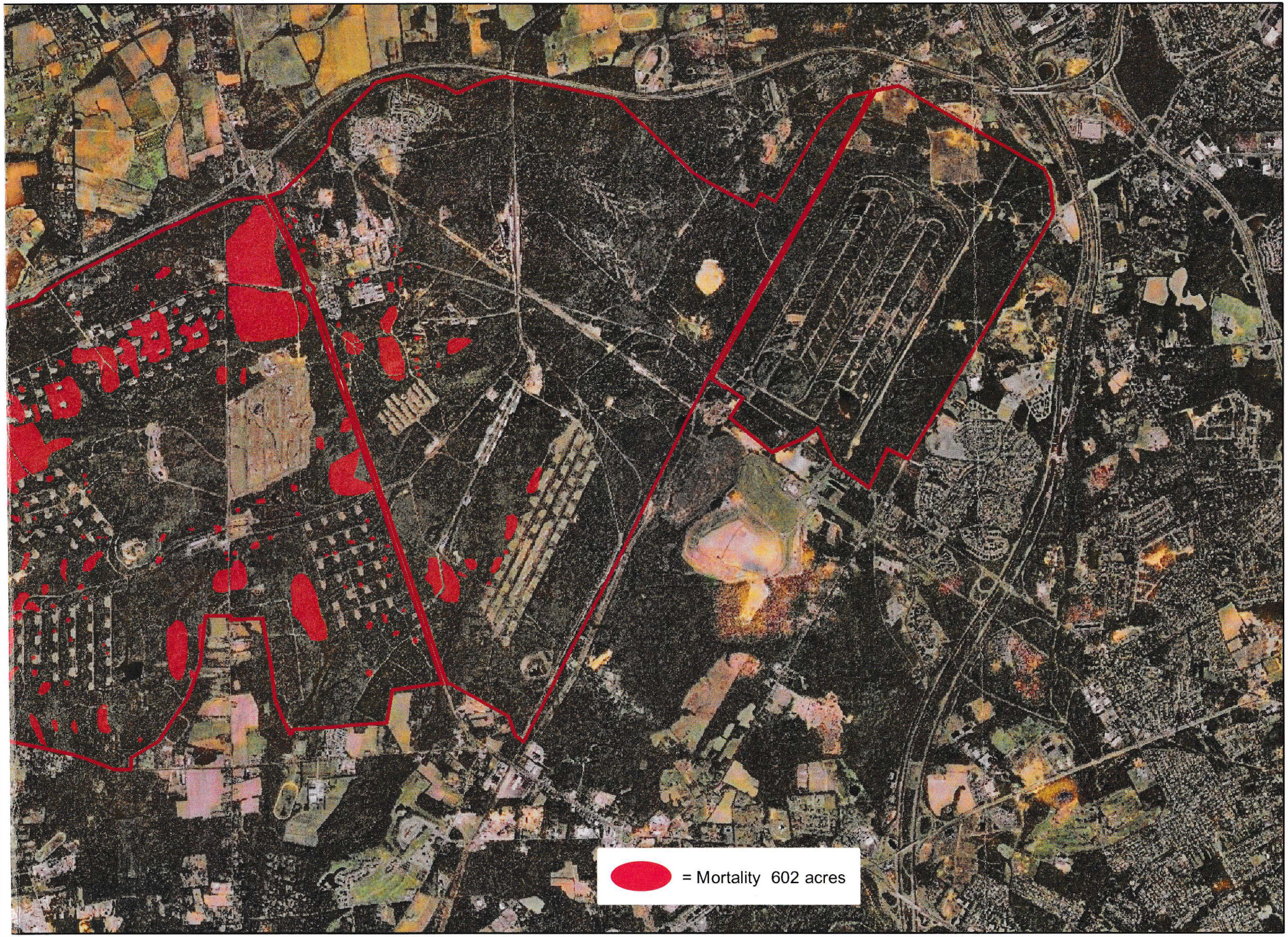
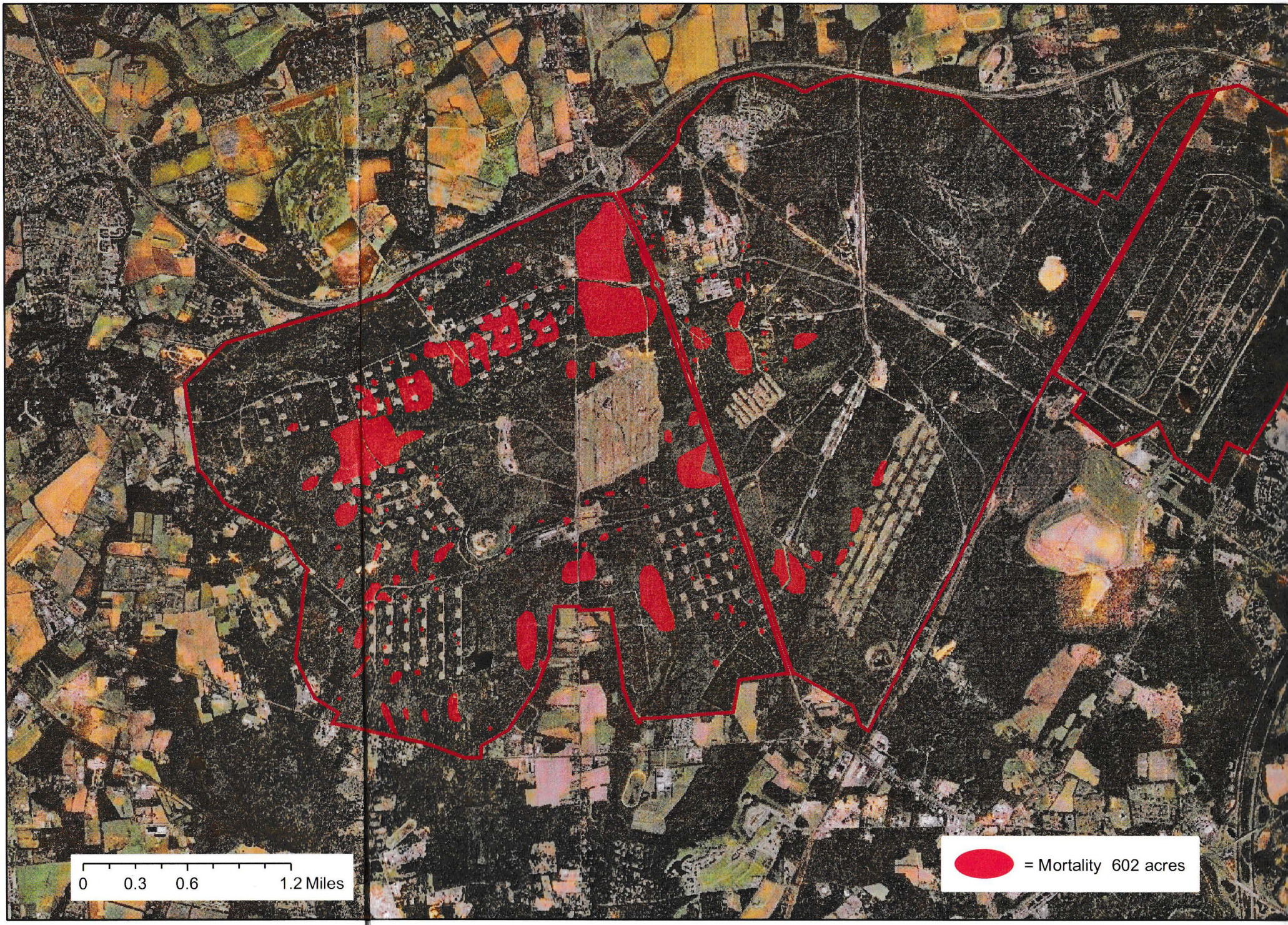


Figure 2. -- Mortality areas detected through aerial and ground surveys conducted at Earle Naval Weapons Station on June 17 and July 29, 2009



Basal area in the mortality areas ranged from 60-150 and averaged 107 square feet per acre while the number of trees ranged from 89-643 and averaged 244 per acre. Basal area of oak species ranged from 60-150 and averaged 97 square feet per acre while the number of oak trees ranged from 30-634 and averaged 213 per acre. Basal area and the number of trees per acre are presented in Table 1 for each of the prism plots.

Mortality occurred on 190 of the 268 trees that were tallied during the survey. All but one of these 190 trees was an oak. Approximately 78 percent of the oaks in the mortality areas are dead. Basal area of the oak mortality ranged from 20-150 and averaged 76 square feet per acre while the number of dead oak trees ranged from 11-634 and averaged 169 per acre. The basal area and trees per acre of the oak mortality for each prism plot is also presented in Table 1. There were four plots (#s 14, 18, 20 and 21) that were composed entirely by dead oaks. Based on plot data, there are over 101,000 dead oak trees in the delineated mortality areas.

Mortality figures for each of the five oak species encountered in the mortality areas is presented in the table below. Chestnut oak, the most tallied tree, had the lowest mortality rate of any oak at 68 percent. All other oak species had at least a 78 percent mortality rate with white oak having the highest mortality rate at 92 percent.

Mortality of oak species in the mortality areas at Earle NWS

species	# of tallied trees	# dead	# living	mortality rate
chestnut oak	109	74	35	68%
white oak	60	55	5	92%
red oak	30	25	5	83%
black oak	27	21	6	78%
scarlet oak	17	14	3	82%
all species	243	189	54	78%

With 78 percent of the oaks dead in the mortality areas, crown condition 6 was the most common crown condition followed by crown condition 2 (6-25% dieback) and then crown condition 1 (5% or less dieback). Only approximately 6 percent of the oaks had dieback that ranged from 26-99% (crown condition 3, 4 and 5). The crown condition information for the oaks is summarized and presented in the table below.

Crown condition of the oaks in the mortality areas

Crown condition ranking	# of oaks	% of all oaks
1 (≥ 5 branch dieback)	11	4.5%
2 (6-25% branch dieback)	28	11.5%
3 (26-50% branch dieback)	8	3.3%
4 (51-75% branch dieback)	3	1.2%
5 (76-99% branch dieback)	4	1.6%
6 (dead)	189	77.9%
All crown conditions	243	100%

Crown condition rankings were further analyzed by including crown class. For this comparison the dominant (crown class 1) and codominant (crown class 2) trees were combined into one class because there was very few dominant trees tallied and both of these classes usually have at least fairly large and healthy crowns that make up the majority of the forest canopy. The intermediate (crown class 3) and suppressed (crown class 4) trees were also combined into one class since there were not a lot of trees in either class and both of these classes have a small to moderate size crowns that struggle to reach the forest canopy. The distribution of crown condition by crown class for the oaks is presented in Table 2. The dominant/codominant class had a lower mortality rate (crown condition 6) than the intermediate/suppressed class (77.2% vs 80.5%) and the dominant/co-dominant class had more in the crown condition 1 and 2 classes compared to the intermediate/suppressed class (16.3% vs. 9.8%). In other words, the dominant/codominant class had a slightly lower mortality rate and had more trees with light or insignificant dieback.

The crown condition rankings by crown class were even further analyzed for each of the five oak species (Tables 3A-3E). For chestnut oak (Table 3A), the dominant/codominant class had a slightly lower mortality rate than the intermediate/suppressed class (67.1% vs 70.8%). Also, approximately 25 percent of the dominant/codominant class had either light or insignificant dieback compared to only half of that percentage for the intermediate/suppressed class. For white oak (Table 3B), the mortality rate of the dominant/codominant class was 89.6 percent while it was 100 percent for the intermediate/suppressed class. For red oak (Table 3C), all the dominant/codominant were either dead (83.4%) or had either light or insignificant branch dieback (16.6%). There were no intermediate/suppressed red oaks tallied during the survey. For black oak (Table 3D), the mortality rate of the intermediate/suppressed class was lower than the rate for the dominant/codominant class (70% vs 78.3%). However, there were only four trees in this intermediate/suppressed class. For scarlet oak (Table 3E), the dominant/codominant class was very similar to red oak as the mortality rate was 81.2 percent and the remaining 18.8 percent had either light or insignificant dieback.

There is a total of approximately 4481 board feet (International ¼ inch Rule) of saw timber per acre in the mortality areas with living oaks comprising 1164 board feet, dead oaks comprising 2882 board feet with the other 435 board feet per acre comprised by non-oaks. In the 602 acres of delineated mortality, there is approximately 1,734,964 board feet of dead oak sawtimber.

There is approximately 21 cords of pulpwood per acre in the mortality areas. Non-oaks comprise approximately 1 cord, living oaks comprise approximately 3 cords and dead oaks comprise approximately 17 cords per acre. In the delineated mortality areas, there is approximately 10,234 cords of dead oak pulpwood.

The understory in most of the mortality areas are dominated by blueberry (*Vaccinium spp.)* as it was found in 23 of the 25 plots (Figure 3). Common greenbrier (*Smilax rotundifolia)* pitch pine, sweet gum and sweet pepper bush (*Clethra alnifolia*) were each found in three plots. American beech (*Fagus grandifolia*), chestnut oak and sassafras were each found in one plot.

Approximately, 886 acres of gypsy moth defoliation were detected at Earle NWS in 2006, 797 acres in 2007 and 877 acres in 2008. From 2006 to 2008, 1347 acres have been defoliated once, 509 acres have

Figure 3 – Mortality area with a blueberry understory

been defoliated twice and 65 acres have been defoliated three times (Figure 4). Approximately 62% of the mapped mortality is located where defoliation was mapped from 2006-2008 (Figure 5).

DISCUSSION

Most, if not all the areas where significant mortality occurred, were likely defoliated by gypsy moth. Oaks, which comprised 91 percent of all the basal area in the mortality areas, are a preferred food source of the gypsy moth. All but one of the dead trees tallied during the ground survey were oaks. Also one must consider that aerial surveys are a good way to collect information on a large scale fairly quickly, but are usually not accurate enough to provide pinpoint information. An area of defoliation that is actually 8 acres in size might be mapped as 6 acres or it might be mapped as 8 acres but it is shifted in one direction or another by 300 feet. Based on the size of the mortality areas when compared with the size of the defoliated areas it looks like there were a lot of small areas of defoliation that were not mapped. There are over a hundred mortality areas an acre or less in size but only a handful of defoliation areas that size. In years when there is a large amount of defoliation, sometimes the small areas are overlooked or just missed. When conducting aerial surveys one must decide if the goal is to map all the defoliation regardless how long it takes or map as much of the defoliation as you can in a reasonable amount of time. The latter approach was taken. There were numerous mapped mortality areas that were partially in or adjacent to defoliated areas. If the defoliated areas had been mapped with more accuracy, they would probably be located within the mortality areas. One must not forget that the survey aircraft was traveling about 140 miles per hour or 200 feet per second. Most of the defoliation that occurred from 2006-2008 was located in the western two-thirds of Earle NWS and that is where all the delineated mortality is located.

Mortality after defoliation can be widespread and severe. Some stands may experience 80-100% mortality (Campbell and Sloan 1977, Gansner and Herrick 1984). Campbell and Sloan also found in stands where oaks comprised at least two-thirds of the basal area and were defoliated, 48 percent of the oak basal area died. Looking at the plot data from Earle NWS, oak basal area is at least two-thirds in every plot and 78 percent of the oak basal area is now dead. There are several stands at Earle NWS where mortality is 80-100 percent which is similar to what Campbell and Sloan found and also Gansner and Herrick. However, there is a pretty large difference between the 48% average oak basal area mortality that Campbell and Sloan found and the 78% at Earle NWS. One explanation for the difference is that the Earle NWS plots were established only in plots where mortality was delineated while the plots established by Campbell and Sloan were established prior to defoliation and any subsequent mortality. They likely had some plots with little mortality which reduced their overall oak mortality figure. As previously mentioned, the plots at Earle NWS were established only in the mortality areas. In these areas, oak basal area mortality ranged from 37.5 percent to 100 percent. If plots were established in the defoliated areas instead of the mortality areas, the 78 percent mortality rate would be reduced. It is likely that some of the defoliated stands have very little mortality while other stands have 80-100 percent oak mortality.

Tree mortality is greatly influenced by the intensity of the defoliation, number of times defoliated, health of tree prior to defoliation and weather conditions during and after defoliation. Mortality is likely to increase as the intensity of the defoliation increases. A tree that is completely defoliated is much more likely to die than a tree defoliated 25-30 percent. Likewise, a tree defoliated in consecutive years is also more likely to die than a tree defoliated only once. A tree with a large and healthy crown is also much

at Earle Naval Weapons Station from 2006-2008.

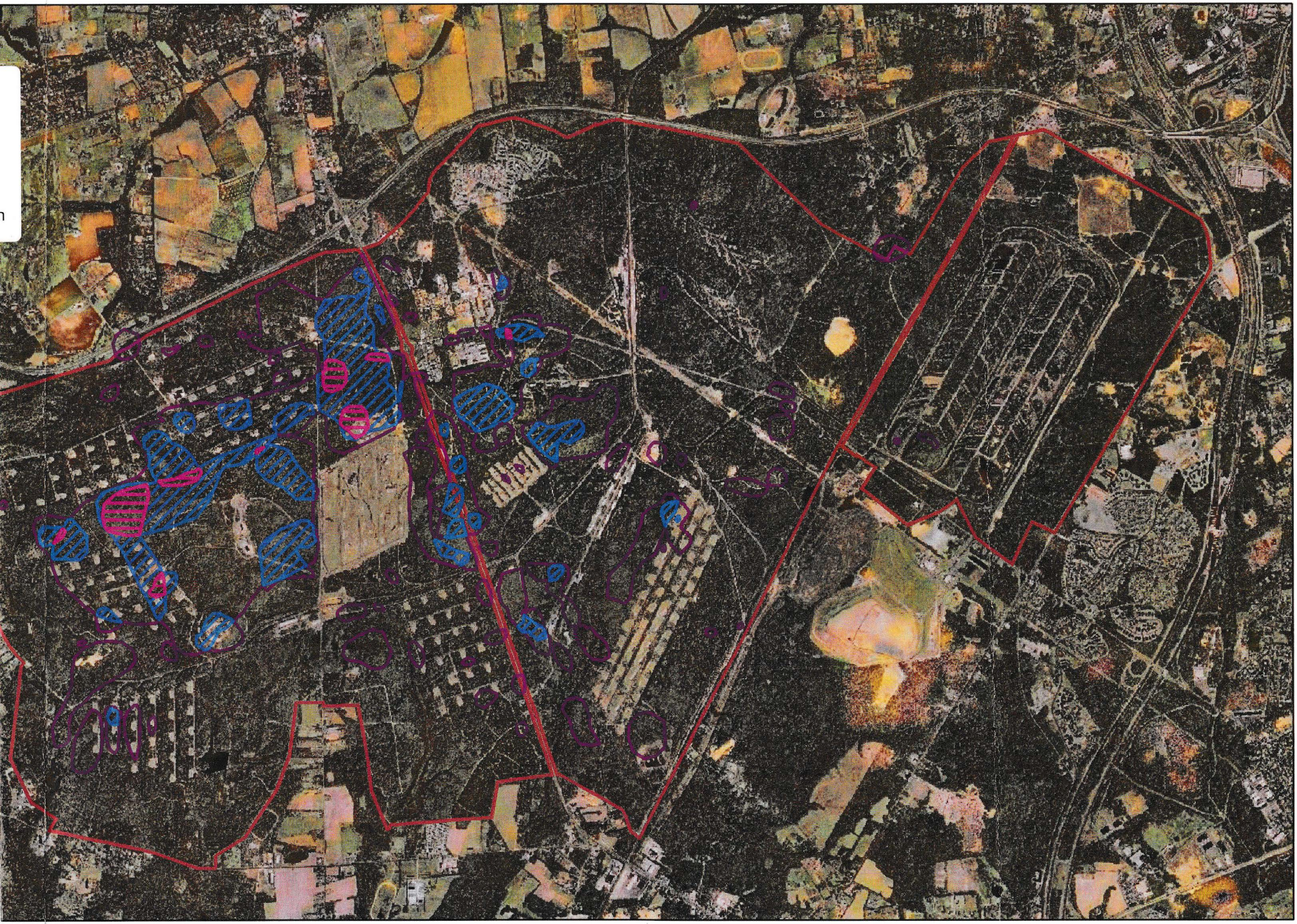
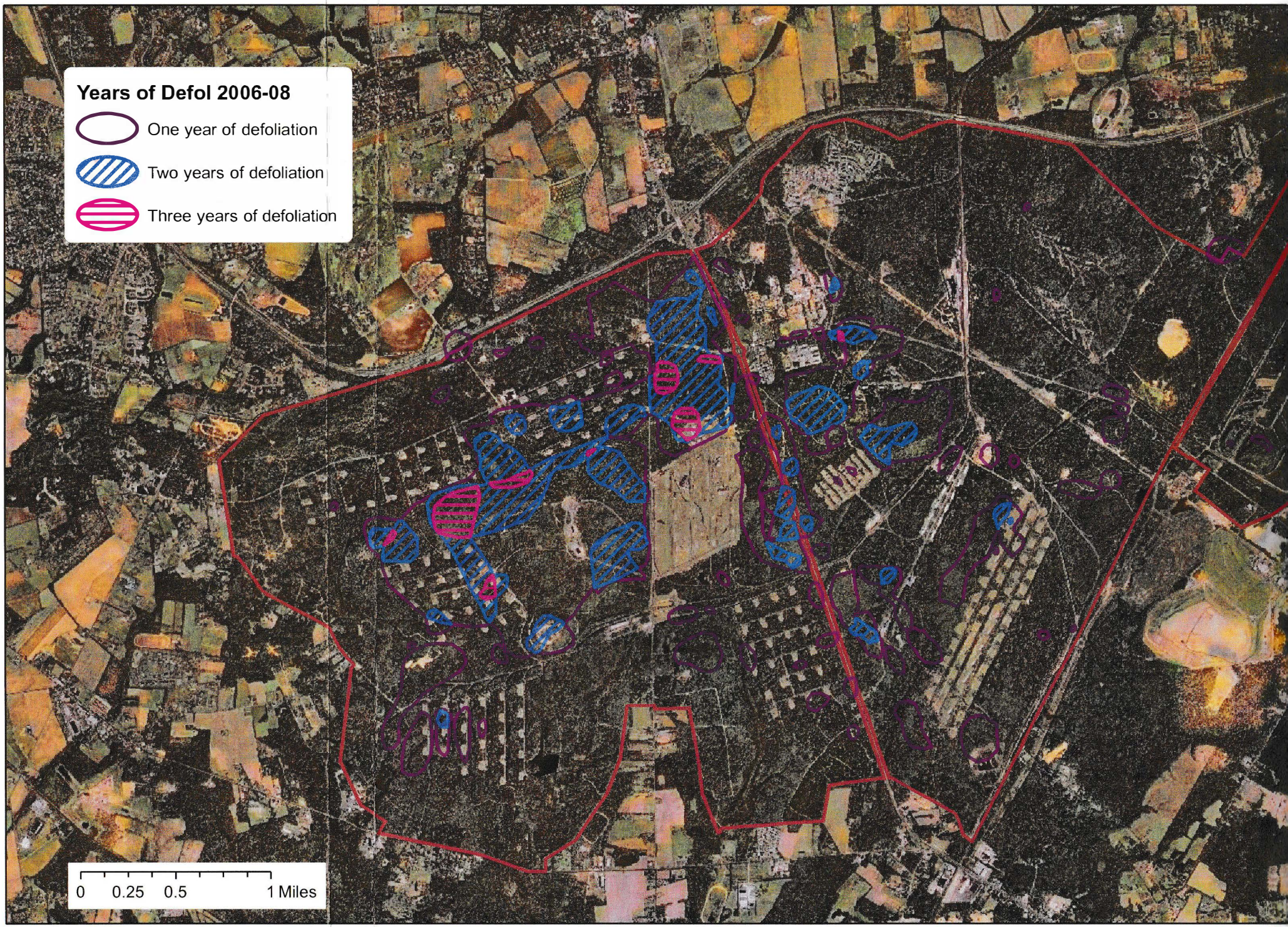


Figure 4. -- Gypsy moth defoliation at Earle Naval Weapons Station from 2006-2008.



Earle Naval Weapons Station from 2006-2008, along with the mortality areas detected in 2009.

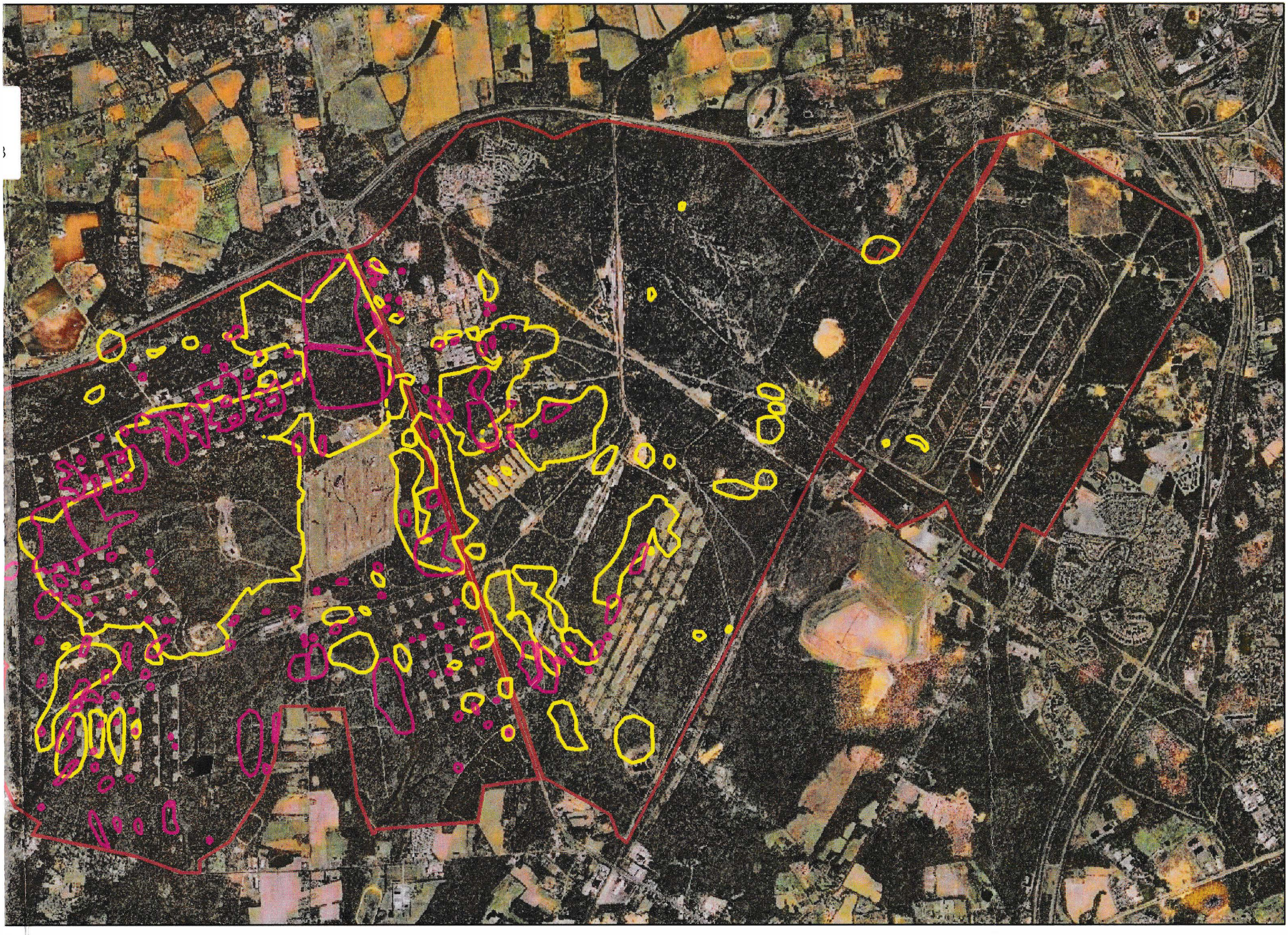
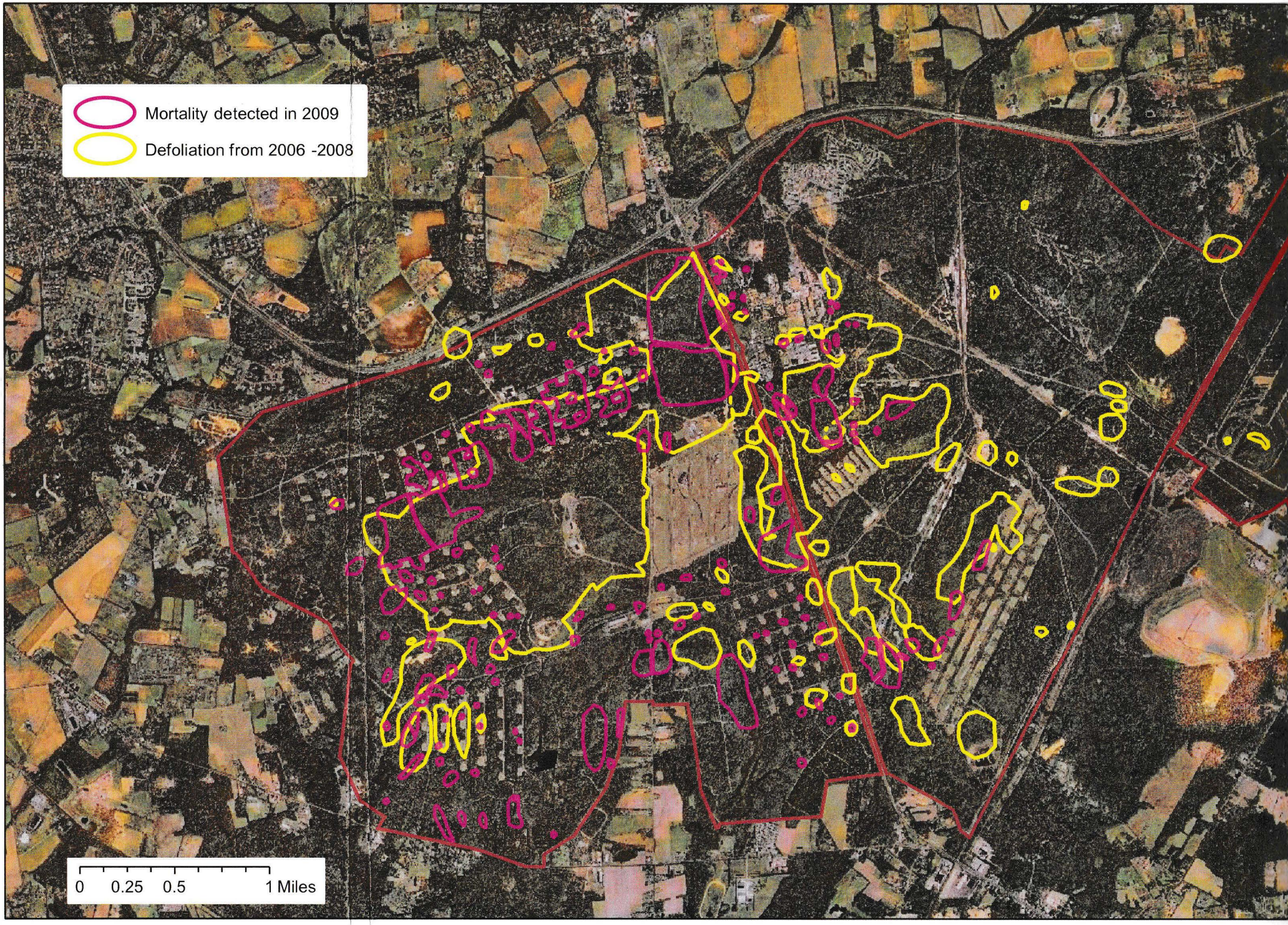


Figure 5. -- Gypsy moth defoliation at Earle Naval Weapons Station from 2006-2008, along with the mortality areas detected in 2009.



more likely to survive a defoliation event than a tree with a small crown. Defoliated trees are also more likely to die during a drought year compared to a year with ample rainfall. Defoliation may vary from tree to tree even over a very small area and was never tracked on a tree by tree basis at Earle NWS. One tree may have been defoliated 100 percent while the one next to it may have been defoliated 60 percent.

Based on the Earle NWS plot data, white oak had the highest mortality rate at 92 percent, followed by red oak at 83 percent, scarlet oak at 82 percent, black oak at 78 percent and chestnut oak at 68 percent. Crow and Hicks (1990) found that the mortality rate after a defoliation event on chestnut oak was more than twice the rate of black oak, red oak, scarlet oak or white oak. Gansner and Herrick (1987) found that mortality after defoliation was the highest on black oak, followed by scarlet oak, chestnut oak and white oak while Fosbroke and Hicks (1989) found the highest mortality rate after defoliation on scarlet oak followed by black oak, chestnut oak, white oak and red oak. There is a lot of varying species mortality data available and the results may vary from region to region and from one time frame to the next. As previously mentioned, plots were established only in the delineated mortality areas. Areas that were defoliated but no mortality was delineated were not surveyed. If these areas were included, the mortality rates would decrease and the order of the mortality rate of the oak species may change. Also as previously mentioned, defoliation was not tracked on a tree by tree basis at Earle NWS. Therefore, an accurate overall mortality rate following defoliation could not be calculated for oaks as a whole, for individual species of oaks or for crown classes. Also some of the crown classes had very few trees in them and was difficult to draw any type of conclusion from them. One general statement that can be made is that in the mortality areas, mortality was heavy on all species of oaks and was slightly higher on the intermediate/suppressed class than the dominant/codominant class.

Species composition is likely to change in the mortality areas, especially in the larger ones. It is likely that the larger areas will go from being dominated by oak species to stands where oak is a minor component. Very little oak regeneration was noticed in the mortality areas. Most of the areas had a thick carpet of blueberry in the understory. The small mortality areas will have a better chance of having oak regeneration and thus oak becoming established because acorn production can also come from oaks adjacent to the mortality areas. It is likely that invasive plants may become established in the mortality areas. Most invasive species require a lot of sun light and these mortality areas will have large amounts of sun light reaching the first floor. Several tree of heaven (*Ailanthus altissima*) were noticed along the forest edges at Earle NWS and they may eventually spread and inhabit the mortality areas.

Mast (acorn) production will greatly be reduced in the mortality areas due to this loss of 78 percent of the oak basal area. Although mast production may actually increase on individual living oaks since their crowns have plenty of space to grow, overall production will be substantially decreased. Oaks that were once good mast producer and were defoliated and now have significant dieback may now produce very little mast. Gottschalk (1990) found that defoliation can cause up to 5 years of complete mast failure regardless if there is no tree mortality. The loss of mast production is likely to have adverse effects on wildlife species such as deer, turkey and squirrels that rely heavily on oak mast as a food source. Some species of birds such as pileated woodpecker are likely to benefit from the mortality since they prefer areas with large quantities of dead woody material.

The fire danger at Earle NWS will be increased due to all the dead and cured wood. Although this area of New Jersey is not as susceptible to a wildland fires as the Pine Barrens, fires do occasionally occur. This large amount of cured wood not only increases the chance of fire, the fire is likely to burn hotter and will take more effort to suppress.

Table 1 – Basal area (BA) and trees per acre (TPA) by plot in the mortality areas

Plot #	BA	Oak BA	Oak BA dead	TPA	Oak TPA	Oak TPA dead
1	110	100	100	643	634	634
2	100	100	50	194	194	107
3	80	80	50	209	209	167
4	110	100	90	231	213	184
5	110	60	60	251	62	62
6	100	90	80	247	234	221
7	90	90	60	293	293	239
8	120	120	80	247	247	155
9	130	130	50	195	195	71
10	120	120	80	351	351	210
11	110	80	80	179	68	68
12	100	100	70	330	330	69
13	130	110	40	339	314	191
14	60	60	60	89	89	89
15	130	130	110	381	381	359
16	110	110	100	142	142	130
17	130	130	100	227	227	199
18	150	150	150	412	412	412
19	80	60	50	96	76	63
20	80	80	80	210	210	210
21	90	90	90	134	134	134
22	90	80	40	122	71	34
23	90	60	20	119	30	11
24	130	100	100	145	63	63
25	130	100	100	315	136	136
range	60-150	60-150	20-150	89-643	30-634	11-634
average	107	97	76	244	213	169

Table 2 – Distribution of crown condition by crown class for oak species

Crown class	Crown condition	# of oak trees	% of crown class
1 and 2	1	11	5.4%
1 and 2	2	24	11.9%
1 and 2	3	5	2.5%
1 and 2	4	2	1.0%
1 and 2	5	4	2.0%
1 and 2	6	156	77.2%
1 and 2	all crown conditions	202	100%
3 and 4	1	0	0%
3 and 4	2	4	9.8%
3 and 4	3	3	7.3%
3 and 4	4	1	2.4%
3 and 4	5	0	0%
3 and 4	6	33	80.5%
3 and 4	all crown conditions	41	100%

Table 3A – Distribution of crown condition by crown class for chestnut oak

Crown class	Crown condition	#of trees	% of crown class
1 and 2	1	9	10.6%
1 and 2	2	12	14.1%
1 and 2	3	3	3.5%
1 and 2	4	1	1.2%
1 and 2	5	3	3.5%
1 and 2	6	57	67.1%
1 and 2	all crown conditions	85	100%
3 and 4	1	0	0%
3 and 4	2	3	12.5%
3 and 4	3	3	12.5%
3 and 4	4	1	4.2%
3 and 4	5	0	0%
3 and 4	6	17	70.8%
3 and 4	all crown conditions	24	100%
all classes	1	9	8.3%
all classes	2	15	13.6%
all classes	3	6	5.6%
all classes	4	2	1.8%
all classes	5	3	2.8%
all classes	6	74	67.9%
all classes	all crown conditions	109	100%

Table 3B – Distribution of crown condition by crown class for white oak

Crown class	Crown condition	#of trees	% of crown class
1 and 2	1	0	0%
1 and 2	2	2	4.1%
1 and 2	3	1	2.1%
1 and 2	4	1	2.1%
1 and 2	5	1	2.1%
1 and 2	6	43	89.6%
1 and 2	all crown conditions	48	100%
3 and 4	1	0	0 %
3 and 4	2	0	0 %
3 and 4	3	0	0 %
3 and 4	4	0	0 %
3 and 4	5	0	0 %
3 and 4	6	12	100 %
3and 4	all crown conditions	12	100%
all classes	1	0	0 %
all classes	2	2	3.2 %
all classes	3	1	1.7 %
all classes	4	1	1.7 %
all classes	5	1	1.7 %
all classes	6	55	91.7 %
all classes	all crown conditions	60	100%

Table 3C – Distribution of crown condition by crown class for red oak

Crown class	Crown condition	#of trees	% of crown class
1 and 2	1	1	3.3 %
1 and 2	2	4	13.3%
1 and 2	3	0	0 %
1 and 2	4	0	0 %
1 and 2	5	0	0 %
1 and 2	6	25	83.4 %
1 and 2	all crown conditions	30	100%

There were no crown class 3 or 4 trees for this species

Table 3D – Distribution of crown condition by crown class for black oak

Crown class	Crown condition	#of trees	% of crown class
1 and 2	1	0	0%
1 and 2	2	4	17.4%
1 and 2	3	1	4.3%
1 and 2	4	0	0%
1 and 2	5	0	0%
1 and 2	6	18	78.3%
1 and 2	all crown conditions	23	100%
3 and 4	1	0	0%
3 and 4	2	1	25.0%
3 and 4	3	0	0%
3 and 4	4	0	0%
3 and 4	5	0	0%
3 and 4	6	3	75.0%
3 and 4	all crown conditions	4	100%
all classes	1	0	0%
all classes	2	5	18.5%
all classes	3	1	3.7%
all classes	4	0	0%
all classes	5	0	0%
all classes	6	21	77.8%
all classes	all crown conditions	27	100%

Table 3E – Distribution of crown condition by crown class for scarlet oak

Crown class	Crown condition	#of trees	% of crown class
1 and 2	1	1	6.3 %
1 and 2	2	2	12.5 %
1 and 2	3	0	0 %
1 and 2	4	0	0 %
1 and 2	5	0	0 %
1 and 2	6	13	81.2 %
1 and 2	all crown conditions	16	100%
3 and 4	1	0	0 %
3 and 4	2	0	0 %
3 and 4	3	0	0 %
3 and 4	4	0	0 %
3 and 4	5	0	0 %
3 and 4	6	1	100 %
1 and 2	all crown conditions	1	100%
all classes	1	1	5.9 %
all classes	2	2	11.8 %
all classes	3	0	0 %
all classes	4	0	0 %
all classes	5	0	0 %
all classes	6	14	82.3 %
all classes	all crown conditions	17	100%

With all this mortality, the number of hazard trees at Earle NWS has drastically increased. These dead trees will fail and start falling in great numbers for the next several years. During the ground survey, it was noticed that a dead oak in a mortality area had fallen over a road and snapped wire on its way down. Issues involving these dead trees will increase over the next several years.

Although Earle Naval Weapons Station in not in the business of wood production and the quality of the wood in the mortality areas is not great, mortality was detected on approximately 1,734,964 board feet of sawtimber and 10,234 cords of pulpwood. Using the figures of 150 dollars a thousand for mixed oak sawtimber and 6 dollars a cord for pulpwood, the approximate value of the dead wood if it was still living is 321,504 dollars.

RECOMMENDATIONS

In order to prevent defoliation and subsequent mortality, suppression projects should be implemented at Earle NWS when gypsy moths are sufficient to cause noticeable defoliation. Gypsy moth egg mass surveys were conducted in the Fall of 2005, 2006 and 2007 and each year the survey detected high gypsy moth populations. However, intervention tactics were not implemented until the Spring of 2009 and not before widespread defoliation and subsequent mortality had occurred. These 602 acres of mortality could have been prevented.

A salvage operation should be implemented in the mortality areas if it does not interfere with the security of this facility and if there are markets for this wood in this area of New Jersey. The salvage operation would reduce the fire danger, reduce the amount of hazard trees and prevent the total monetary loss of these dead oaks. Donley and Feicht (1985) found that a mixture of oak species retained 64 percent of their green wood value 3 years after their death. The quality of pulpwood is not substantially reduced in the first 5 years after the death of a tree. There is still value in the dead trees.

If a salvage operation is not feasible, the dead trees in high use areas and areas around roads, buildings and wires should be felled to reduce the potential harm that these trees can cause.

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File Code: 3400
Date: November 5, 2009

Patricia Chizmadia
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201 Route 24 South, Building C-23
Colts Neck, NJ 07722-5031

Dear Patty:

Enclosed are two copies of the Oak Mortality Survey at Earle Naval Weapons Station report.

In brief, oak mortality was detected in 168 areas totaling 602 acres. Approximately 78 percent of the oaks are dead in these mortality areas. Mortality has occurred on over 101,000 oak trees causing the loss of 1,734,964 board feet of sawtimber and 10,234 cords of pulpwood.

Most, if not all of this mortality, was caused by gypsy moths. The mortality could have been prevented if wide spread gypsy moth defoliation did not occur at Earle Naval Weapon Station from 2006-2008.

I will be at Earle Naval Weapons Station on November 17 and will be happy to discuss the report with you.

Sincerely,

Rodney L. Whiteman

RODNEY L. WHITEMAN
Forester
Forest Health Protection

Enclosure

Cc: Joe Zoltowski, NJDA
Jon Klischies, NJDF
Robert Lueckel, MFO

RLW/blm

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